


INTERDIFFUSION AND ROUGHNESS IN FE/SI, CO/SI and NIFE/SI MULTILAYERS

A. Chaiken and R. P. Michel, LLNL, Livermore, CA; M. W. Lane,⁺ Emory and Henry College, Emory, VA

 Recent studies of Fe/Si multilayers have reported anomalous magnetic properties. In order to understand these phenomena and compare closely related systems, we have prepared a series of Fe/Si, Co/Si and NiFe/Si multilayers by ion-beam sputtering. The Si-based multilayers are more complex to understand than the much-studied ferromagnet/paramagnetic-metal multilayers due to the variety of phases that may form at the interfaces. Film morphology has been studied for samples prepared with a variety of substrate temperatures, substrate materials, and ion-beam energies. Extensive x-ray diffraction studies show that Fe/Si multilayers have better layering than either Co/Si or NiFe/Si. Modeling of low-angle x-ray spectra shows that the interfaces of the multilayer are anisotropic, with the metal-on-Si interfaces being wider than the Si-on-metal interfaces, similar to previous results on Mo/Si x-ray mirrors. Rocking curves and asymmetric x-ray scans have been taken at low angle in order to try to understand the contributions of diffuse scattering and correlated roughness.

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Contact and Presenting Author:

A. Chaiken, Mailstop L-268, LLNL, Livermore, CA 94551, Tel. (510) 422-7129, FAX (510) 422-7300, email chaiken@cmsgee.llnl.gov

Co-Author:

R. P. Michel, Mailstop L-268, LLNL\\Livermore, CA 94551, Tel. (510) 422-7129 FAX (510) 422-7300\\email michel@cmsgee.llnl.gov

Co-Author:

M. W. Lane, P.O. Box 284, Emory, VA24327, Tel. (703) 944-4121 ext. 3556